Fun with Crystals

Baking soda, also known as sodium bicarbonate, is something almost all of us have in our kitchens. It has a wide assortment of uses. But do you know where 90% of the baking soda in our country comes from? It comes from Trona mines in Wyoming! If you have baking soda in your kitchen, you have Wyoming baking soda. In this activity, you will learn about Wyoming Trona and grow your own baking soda crystals.

In this activity, your family will:

- Learn where baking soda comes from
- Learn how Trona *(baking soda)* is mined
- Experiment with creating baking soda crystals
- Create a sign for their crystal display

Materials needed:

- 2 cups of water *(to be boiled)*
- Heatproof bowl
- ¼ cup baking soda *(or a little more)*
- 2 colors of food coloring *(optional)*
- 2 small jars or glasses
- Plate or pan large enough to hold both jars about 6 inches apart
- 12 inches of string, twine, or yarn
- 2 paperclips *(or another small object you can tie a string to)*
- Paper for recording observations and making a sign

Key Words to know:

Soda Ash – Sodium carbonate in powdery white form; used in the manufacturing of glass, ceramics, soaps, paper, petroleum products, sodium salts, as a cleanser, for bleaching, and in water treatment

Trona – a gray mineral that occurs as an evaporate in salt deposits and consists of a hydrated carbonate and bicarbonate of sodium

Preparation:

- Watch the videos about Trona, and how it is mined in Wyoming.
- Gather materials for your crystal experiment.
- Find a good place to set your project where it can be observed without getting moved for a few days.

Do the Activity:

Part 1: Learn where baking soda comes from:

1. Watch the video by the Wyoming Geological Survey (https://www.youtube.com/watch?v=ovtNHFFzG78) about Wyoming's Trona Resources to learn about trona, where it comes from, how it is mined, and what we do with it. While watching the video, watch for the following:
    - What natural event occurred that created such a large deposit of Trona in our state? *(dry climate, evaporation of saturated water)*
    - Besides baking soda, what other products are made from Trona or soda ash? *(glass, toothpaste, kitty litter, laundry detergent)*
    - What does Trona look like in its natural form before they take it out of the rocks? *(crystals)*

Part 2: Prepare to grow crystals:

As you saw in the video, Trona's natural form is crystals. You can grow your own baking soda crystals following these directions: *(You can find instructions with diagrams at:* https://www.wikihow.com/Make-Baking-Soda-Crystals)

1. Boil 2 cups of water and pour it into a heat-proof bowl or cup *(make sure you have help or permission from an adult to do this part).*
2. Stir in half ($^1/_8$ cup) of the baking soda. Stir until it dissolves completely.
3. Add the remaining baking soda a spoonful at a time, stirring each time until it dissolves.
4. Continue to add baking soda until it won't completely dissolve any more. You may not need the entire ¼ cup, or you may need to add a little bit more than ¼ cup. You will know that you are done when a thin layer of white powder forms on the bottom of the bowl or jar. This is called a saturated solution *(just like the lakes where the Trona was formed)* when the water can't dissolve any more baking soda.
5. Let the solution cool for about 20 minutes. When it is cool, divide it equally between two small jars. Leave the last little bit of solution and extra, undissolved baking powder at the bottom of the bowl. You will clean this out when you wash the bowl or cup.
6. Set both jars about 6 inches apart on a plate or pan.

7. Add 5 to 10 drops of food coloring to the jars and stir the solution.* You can add different colors to each jar if you want to create multiple colors of crystals. *(*optional, but the colors make it easier to see the crystals)*
8. Cut a piece of string about 12 inches long. (*Baking soda crystals need a structure to form around, and string works well.)*
9. Tie a weight to each end of the string *(i.e. a paperclip, beads, washer).*
10. Place one end of the string into each of the jars, with the string hanging loosely between them. It should look like a smile – not too tight, and not touching the plate.
11. Put your experiment in a place where it won't be disturbed for a few days. Any movement can make the project fail.

Part 3: Watch the crystals grow:

1. It can take 5 – 10 days for crystals to form. They form as the baking soda solution is absorbed by the string and evaporates.
2. Check your crystals daily, but don't touch them. Record what you see. Consider the following questions:
   - How much did your crystals grow? At first, you may not see anything. Remember, it takes a few days.
   - Describe the crystals. Are they smooth, sharp, fluffy, spikey, long, short? How would you describe them to someone who can't see them?
   - What effect did the color have on the crystals? What other colors do you want to try?
   - How do they compare with the crystals in the Trona mining video? How are they the same? How are they different?
   - If they didn't grow, what may have happened? What would you do differently so that it doesn't happen again?
3. When you are done growing the crystals *(you can keep growing them until all the water is evaporated),* remove the string from the jars and set it on a plate. Let it dry. Touch the crystals. Consider the following questions:
   - What does it feel like?
   - What happens to the crystals when you touch them?
   - Pluck some off the string and pinch them with your fingers? What happens? What does it look like now?
4. Create a display sign for your crystals explaining what they are and how they were formed. Pretend you are in charge of the crystal display at a museum and share it with your family.

Bonus:

- Try creating stalactites and stalagmites by carefully drizzling a few drops of solution from your jars over the string each day.

- Instead of using a string, try growing your crystals inside of a clean eggshell. Swirl a few drops of solution around the shell, then add a few more drops of solution each day.
- Follow the same procedure for creating crystals using Epson salts, sugar, salt, and borax. Compare the types of crystals and add all of them to your museum display.
- Does the temperature of the water matter? Test to see what happens if you don't use boiling water – do crystals still form?

Other baking soda projects:

- Fun projects: https://www.armandhammer.com/articles/7-diy-projects-for-kids
- Science projects: https://www.armandhammer.com/diyscience

Learn more about Wyoming Trona Mining in these lessons and resources from the Wyoming Stewardship Project.

5th Grade:

- **5th Minerals and Energy Lesson 3** Students learn the location of Wyoming's minerals and explore how each is mined.